

# Inspection Guidelines for Turkey Osteomyelitis Complex

## Introduction

This guideline was rewritten to reflect recent changes relating to the implementation of HACCP, the reorganization of FSIS, and to provide a more readable document. This document provides guidance for producing wholesome product. No prior approvals of these guidelines are required. Establishments may substitute alternate Turkey Osteomyelitis Complex (TOC) procedures provided the establishment demonstrates that the procedures are effective in producing a wholesome product. TOC programs may be incorporated within HACCP plans depending on the establishment's assessment of the TOC hazard. This guideline replaces all previous guidelines and Q&A's for TOC.

## Background

TOC is a common condition in turkeys and is usually characterized as a flock problem; although, isolated birds in an otherwise normal flock may be affected. There is a higher incidence of TOC in male turkeys between 18 and 23 weeks of age, but TOC may affect birds of either gender at any age. The classic lesions of TOC are osteomyelitis, swelling of the joints and adjacent soft tissue, and green discoloration of the liver. *Staphylococcus* spp., *Escherichia coli* and a variety of other organisms are routinely isolated from osteomyelitis lesions.

For the purpose of inspection for TOC, plant management designates what is a lot. When a lot exhibits gross lesions of TOC a biased sample is collected. The biased sample is transferred to the TOC-work area and the TOC-diagnostic procedure is performed. The TOC-diagnostic procedure is an examination of the carcasses collected in the biased sample. If any carcass in the biased sample is positive for osteomyelitis, the lot is designated TOC-suspect. Once so designated, all carcasses in the TOC-suspect lot with gross lesions of TOC are retained as TOC suspects and subjected to the TOC suspect examination procedure, an off-line examination of all TOC-suspect carcasses from a TOC-suspect lot. Mature breeder turkeys, one year and older, are exempt from the inspection requirements for TOC.

Plant management must have a comprehensive written procedure describing their TOC program. A copy of the written procedure must be available for review by the VMO. All written procedures must meet the objective of producing wholesome product and describe the measures designed to control product contamination from each TOC procedure conducted by the establishment. All TOC-suspect carcasses must be handled in accordance with the written procedure. The VMO will monitor the written procedure and routinely meet with plant management to assure compliance. If plant management fails to follow the written procedure, or can not demonstrate a consistently effective procedure that does not create a nuisance or compromise product integrity, the VMO will withdraw the TOC procedure.

## **Gross Lesions of TOC**

The diagnostic lesion associated with TOC is osteomyelitis, an inflammation of the bone and marrow cavity. Typical osteomyelitis lesions are distinctive and easy to differentiate from normal bone and cartilage. Lesions appear as caseous, granular, necrotic material within the marrow cavity. At times the material can be removed, leaving a cavity within the bone. The epiphyseal growth plate of long bones is the usual site of osteomyelitis lesions. While all bones can be affected, the proximal tibia is the most common site. The femur and humerus are also frequently involved. Inflammation normally remains confined within the bone and cartilaginous growth plate; however, the inflammatory reaction can progress to involve the adjacent soft tissues and joints.

Carcasses with osteomyelitis lesions usually exhibit a green discoloration of the liver. In some carcasses the margins of the liver are green while the central portion of the liver appears grossly normal. This is commonly referred to as a "green-fringed liver." Not all carcasses with osteomyelitis lesions exhibit this pattern of liver discoloration. The liver can also appear as green streaked, green spotted, or as a totally green liver. Green discoloration of the liver is the most consistent indicator that osteomyelitis might be present. However, many disease and stress conditions induce a green discoloration of the liver so the presence of green discoloration of the liver cannot be considered pathognomonic for osteomyelitis and the TOC-diagnostic procedure is required to confirm the presence of osteomyelitis.

In addition to osteomyelitis and green discoloration of the liver, joint swellings in the hock, stifle, hip, and/or shoulder, and soft tissue swelling in the drumstick, thigh, and breast may be seen. Incision of these areas may reveal abnormal tissue ranging from mildly inflamed muscle and connective tissue, to encapsulated accumulations of hemorrhagic, purulent or caseous exudate within the muscles and tendon sheaths.

## **Grossly similar lesions**

Bone and soft tissue lesions associated with other disease conditions can appear grossly similar to TOC making a definitive diagnosis difficult. Conducting a careful examination of the carcass with attention to differences in the lesions produced by other disease conditions is the best way to determine if a carcass has TOC, or another disease condition. Remember that a carcass can have TOC and another disease condition concurrently. Some factors to consider when examining joint lesions are:

- Carcasses can exhibit synovitis and not be affected with osteomyelitis. This is particularly true for carcasses with lesions in the hock joint due to mycoplasmosis. Mycoplasmosis causes proliferative lesions in tendon sheaths, joints, and air sacs. If the carcass exhibits lesions consistent with mycoplasmosis, then consider that mycoplasmosis may be the cause of the joint lesions. If synovitis is the only lesion identified, then the lot is not designated TOC-suspect and disposition of the lot is in accordance with procedures for synovitis.

- Viral arthritis, a reovirus infection, causes tendonitis and/or tenosynovitis commonly observed as swelling of the tendons and tendon sheaths proximal to the hock joint. If lesions are confined proximal to the hock joints, viral arthritis may be the primary cause.
- Dyschondroplasia and infarct are observed below the growth plate in the metaphysis of the bone. Dyschondroplasia ordinarily resembles sooth, opaque, gray to yellow cartilage. Infarct, or pressure necrosis, appears as a focal circular or linear, dark red to black focal lesion. Neither condition requires corrective action.

### **Lot identification and sampling**

For the purpose of inspection for TOC, plant management designates what is a lot. A lot may be a single grower, one truckload, one hour's production, or any other workable designation. It is suggested that the lot be identified in a manner that identifies the grower. FSIS inspectors, or plant management, must notify the VMO when a lot presented for slaughter inspection includes carcasses that exhibit gross lesions of TOC. When this happens, the VMO will require a biased sample to be collected.

A biased sample consists of ten carcasses selected by the VMO, or VMO's designee, with any indication of TOC and is therefore biased towards the presence of TOC. The biased sample may be the first ten carcasses in the lot with any indication of TOC; but if more than ten carcasses are presented to the VMO, or VMO's designee, than ten of these carcasses will be selected as the biased sample. There is no specific time limit for collecting the biased sample. If ten carcasses exhibiting gross lesions of TOC cannot be obtained early in the lot, it is not necessary to wait until the entire biased sample is collected before beginning the TOC-diagnostic procedure.

The VMO's decision to collect a biased sample and perform the TOC-diagnostic procedure is based on the assumption that osteomyelitis is not present in the lot unless there are specific reasons to suspect otherwise. Since all carcasses with green livers, swollen joints, and/or soft tissue swellings do not have osteomyelitis, the VMO must determine whether or not osteomyelitis is present in any lot exhibiting these lesions.

### **Resampling**

The VMO has the authority to resample any lot to confirm or change the original lot designation. If the VMO determines that conditions within the lot have changed to suggest the presence, or absence, of TOC, and therefore the lot designation does not accurately reflect the TOC status of the flock, it may be necessary to collect a second biased sample. The VMO must exercise professional judgement when deciding if a second biased sample is necessary. There are two situations that may cause the VMO to change the lot designation.

1. The lot was designated TOC-suspect. During the TOC-salvage procedure, no gross lesions of TOC are found. The VMO verifies the TOC-salvage procedure and agrees there are no gross lesions of TOC in the carcasses. The VMO should collect a second biased sample and repeat the TOC-diagnostic procedure. If no carcasses in the second biased sample are positive for osteomyelitis the VMO will designate the lot TOC-negative and instruct FSIS inspectors to discontinue retention of the carcasses with green livers, swollen joints, and/or soft tissue swellings.
2. The lot was designated TOC-negative either because, all of the carcasses appeared normal and no biased sample was collected, or osteomyelitis was not identified in a biased sample. Later, conditions within the lot change to suggest the presence of TOC. This includes the identification, by an FSIS inspector, of a single carcass with a green liver, swollen joint, and/or soft tissue swelling. The VMO may elect to collect a second biased sample and perform the TOC-diagnostic procedure. The single carcass identified by the FSIS inspector is not included in the second biased sample. If any carcass in the second biased sample is positive for osteomyelitis, the lot is designated as a TOC-suspect lot and all carcasses with gross lesions of TOC are retained for the TOC-suspect examination procedure.

### **TOC-Diagnostic Procedure**

The TOC-diagnostic procedure is an examination of the ten carcasses collected in the biased sample. The results of the TOC-diagnostic procedure determine if the lot is designated TOC-suspect or TOC-negative. If osteomyelitis is not detected during the TOC-diagnostic procedure, the lot is designated TOC-negative, no additional carcasses are examined, and carcasses with green livers, swollen joints, and/or soft tissue swellings are not retained. If any carcass in the biased sample is positive for osteomyelitis, the lot is designated TOC-suspect. When a lot is designated TOC-suspect, all carcasses in the lot with gross lesions of TOC are retained and subjected to the TOC-suspect examination procedure.

It is imperative that the TOC-diagnostic procedure is completed as quickly and efficiently as possible; therefore, the TOC-diagnostic procedure may begin as soon as the first carcass in the biased sample is selected. As additional carcasses are collected they can be examined. While the biased sample is being collected and the TOC-diagnostic procedure performed, all carcasses presented for inspection with gross lesions of TOC must be retained. If plant management is concerned about unnecessarily downgrading retained carcasses with permanent identification markings, a nonpermanent method of identification may be used until the lot designation is determined. Plant management is encouraged to provide any assistance that will expedite the TOC-diagnostic procedure.

Each carcass in the biased sample is subjected to a minimum of ten exploratory incisions. The following tissues are incised and examined for the presence of inflammation, exudates, and necrosis in joint structures, surrounding soft tissues, and bone.

- the soft tissues over the lateral aspect of the right and left stifle joints
- the right and left stifle joints
- the right and left hip joints
- the right and left shoulder joints
- the growth plate across the proximal end of the right and left tibia

Incisions across the tibial growth plate should be longitudinal or diagonal; intersect the growth plate; and be of sufficient length and depth to expose the growth plate, the epiphysis, and the metaphysis. Cross-sectional incisions are not recommended because they require a series of incisions in the bone and make examination of the growth plate difficult. A trained plant employee will assist the VMO during the TOC-diagnostic procedure. This employee performs tasks such as transferring carcasses to the TOC-work area, washing and preparing carcasses for examination, making the exploratory incisions, cleaning and disinfecting equipment, and disposing of condemned product. For safety reasons, it is recommended that a trained plant employee make the diagnostic incisions; however, the actual examination of the carcasses during the TOC-diagnostic procedure should be performed by the VMO.

At the discretion of the VMO, the growth plates of the femur and humerus may be incised to confirm or refute the presence of osteomyelitis, and soft tissue swelling may be incised to ascertain whether or not gross lesions of TOC are present. As soon as osteomyelitis is identified in one carcass in the biased sample, the lot is designated TOC-suspect and the TOC-diagnostic procedure may be discontinued. During the TOC-diagnostic procedure, the viscera remain with the carcass.

### **TOC-Suspect Examination Procedure**

Carcasses from a TOC-suspect lot with gross lesions of TOC, but without signs of systematic change, will be retained and subjected to the TOC-suspect examination procedure. Carcasses with gross lesions of TOC that the FSIS inspector condemns for septicemic/toxemic changes are not retained. The VMO shall make any necessary adjustments to inspection procedures and, if necessary, reduce postmortem line speeds to assure that FSIS inspectors have an adequate opportunity to identify TOC-suspect carcasses.

The TOC-suspect examination procedure differs slightly from the TOC-diagnostic procedure. In the TOC-diagnostic procedure a minimum of two incision across the tibial growth plate are required and the viscera must remain with the carcass. During the TOC-suspect examination procedure, incisions across the tibial growth plate are not required and the viscera does not remain with the carcass. Incision of the tibial growth plates is not required during the TOC-suspect examination procedure for two reasons. First, the presence of osteomyelitis has already been established by the TOC-diagnostic procedure and plant management is not expected to confirm the diagnosis on each carcass. Second,

gross lesions of TOC identified during the TOC-suspect examination procedure must be removed in such a manner that unwholesome osseous tissue is also removed, thereby removing any osteomyelitis lesions.

Plant management's comprehensive written procedure for their TOC program must address the following minimum requirements for the TOC-suspect examination procedure. TOC-suspect carcasses are identified using a marking system and are transferred to a clean hang-back rack. The viscera are removed and condemned and the TOC-suspect carcasses transferred to the TOC-work area. Carcasses are individually suspended in an examination shackle. Before any incision is made into the carcass, the crop, trachea, lungs, and kidneys are removed and the outside of the carcass is thoroughly washed. A trained plant employee will make a minimum of eight incisions in each TOC-suspect carcass. The soft tissues over the lateral aspects of the right and left stifles, the right and left stifle joints, the right and left hip joints, and the right and left shoulder joints will be incised and examined for the presence of inflammation, exudate and/or necrosis. Plant management may choose to include additional incisions in their procedure but are not required to do so. The sequence of the eight incisions, the direction of carcass suspension, and the cleaning of facilities, equipment, and operators' hands must be described in the written procedure. Product handling during the TOC-suspect examination procedure must be consistent with good sanitary practices and minimize contamination of wholesome tissue with any unwholesome material.

### **TOC-Salvage Procedure**

All carcasses that exhibit gross lesions of TOC during the TOC-suspect examination procedure must be subjected to the TOC-salvage procedure or condemned. Carcasses with localized TOC lesions without evidence of systemic change shall be passed after all unwholesome tissues, including the kidneys, are removed and condemned. Carcasses so extensively affected with TOC that salvage is not possible, shall be condemned and disposed of in accordance with 9 CFR 381.95, Disposal of condemned poultry products.

When gross lesions of TOC are detected in the shoulder joint, the humoral portion of the wing, all osseous structures of the shoulder joint, and all affected breast muscle must be removed and condemned. Unaffected breast muscle may be salvaged. When gross lesions of TOC are detected in a stifle joint, the entire leg must be condemned. When gross lesions of TOC are detected in a hip joint, the entire thigh and all osseous structures of the hip must be removed and condemned. If the stifle joint is normal, the drumstick from the affected hindquarter may be salvaged provided it is removed from the thigh in a sanitary manner.

After removal of all unwholesome tissues, TOC-suspect carcasses and parts must be packed in layered ice in a container with continuous drainage and held subject to reexamination by the VMO, or VMO's designee, before being allowed to reenter normal product flow. Reexamination is performed using a ten-unit sample representative of the salvaged product. The frequency of reexamination is based on the incidence of

osteomyelitis at the establishment. Rework of all accumulated product represented by the sample will be required if gross lesions of TOC are found during reexamination. This product is also subject to NTIS procedures.

### **Holding TOC-suspect carcasses**

Plant management may append their written procedure and hold TOC-suspect carcasses prior to the TOC-suspect examination. The appended procedure must meet the following minimum requirements. TOC-suspect carcasses must be identified using a marking system; the crop, trachea, and viscera must be removed; and the entire carcass must be thoroughly washed. No carcass with evidence of sepsis, visible exudates, or incisions other than those required for routine inspection may be held. A continuous flow of product must be maintained. Carcasses must be packed in layered ice in a container with continuous drainage. The containers must be marked to record the time when the first carcass was placed therein. Holding time will be included in the total time required to chill carcasses to 40°F or below. Product cannot be held over from one shift to the next and all operations must be conducted under continuous FSIS inspection. This procedure is for TOC-suspects and does not pertain to product retained for other reasons.

### ***Alternate salvage options***

Plant management may append their written procedure and saddle TOC-suspect carcasses on-line rather than salvage off-line using the TOC-suspect salvage procedure. The appended procedure must meet the following minimum requirements. In a TOC-suspect lot, all TOC-suspect carcasses must be saddled. A trained plant employee will incise and examine the shoulder joints of all TOC-suspect carcasses before the carcass can be saddled. If the shoulder joints appear normal, the carcass can be saddled. If any gross lesions of TOC are found within the shoulder joint, the breast and shoulder must be salvaged in accordance with the TOC-salvage procedure. The VMO, or VMO's designee, will monitor the plant's examination of the shoulder joints.

### **Facilities and Equipment Requirements**

The TOC-work area is a dedicated site that does not interfere with postmortem inspection or other plant functions. It must be located and operated in a manner that prevents cross-contamination of product, equipment and/or facilities. A previously designated off-line knife salvage facility may be utilized provided all facility requirements are met. Minimum facilities requirements are two hundred foot-candles of light (a color-rendering index of 85 is recommended), kidney removal capability, and a minimum of 20 ppm aqueous chlorine for washing carcasses and/or sanitizing facilities and equipment. A properly drained hand washing facility with soap, towels, and hot and cold running water from fixtures that are other than hand operated must be located in close proximity to the TOC-work area. Hang-back racks to hold carcasses transferred from postmortem inspection stations and a separate facility for suspending individual carcasses during TOC-suspect examination and TOC-salvage procedures are required. Properly identified

edible and inedible containers must be available for product that results from TOC-suspect examination and TOC-salvage procedures.

To avoid cross contamination, knives that contact exudates or inflamed, necrotic tissue must be sanitized before additional incisions are made into the carcass. Sanitizing can be accomplished with either 180° F water or chemical sanitizers. Chemical sanitizers must be listed as approved for this purpose in the List of Proprietary Substances and Non-Food Compounds. If 180° F water is utilized, knives must be immersed for at least ten seconds. If chemical sanitizers are used, chlorine compounds at 400 ppm or iodine compounds at 75 ppm, knives must be immersed for at least 10 minutes. A sufficient number of knives should be available to ensure proper immersion time. A temporary use0-of-chemicals permit is not required.

Plant management is responsible for training employees who perform any procedure related to TOC. All employees handling TOC-suspect carcasses must be aware of the importance of washing their hands whenever they contact contaminated tissues or exudates. If clothing becomes contaminated, it must be cleaned or replaced before other product is handled. Exudate that contaminates otherwise wholesome tissue must be removed by trimming.

### **Data Collection**

Carcasses so extensively affected with TOC lesions that salvage is not possible, shall be condemned and the number recorded on MP Form 513 and FSIS Form 6000-16 (MP514) under the "SPECIAL SURVEYS" section, using Code 99. This number will also be recorded on FSIS Form 9061-2 (MP Form 51-1) in the empty block below "Other." Enter Code 99 as the condemnation cause and the number of carcasses condemned for TOC. Carcasses with gross lesions of TOC that the FSIS inspector determines to be condemnable for septicemic/toxemic changes are recorded under the category septicemia/toxemia.

If the VMO has withdrawn the TOC procedure because plant management fails to follow their written TOC-salvage procedure and plant management elects not to trim TOC-suspect carcasses on-line, the carcasses are condemned and recorded as US Condemned under Code 99. If plant management has no written TOC-salvage procedure and elects not to trim TOC-suspect carcasses on-line, the carcasses are condemned and recorded as US Condemned under Code 99.

If plant management discards a carcass before it reaches the inspection station, the carcass is counted and recorded as a plant reject. If plant management has a written TOC-salvage procedure and elects to not salvage TOC-suspect carcasses, the carcasses are counted and recorded as a plant reject. These carcasses are not recorded under Code 99 as condemned.



